

# Towards 111 bunches

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Wolfram Fischer

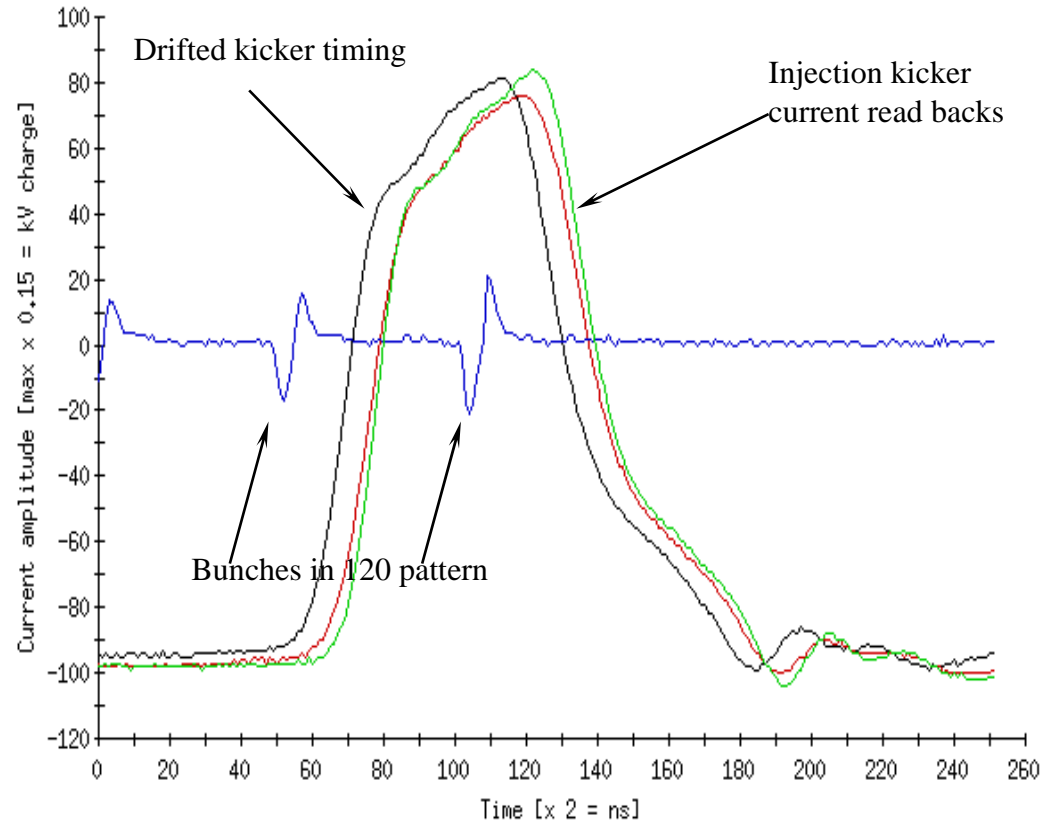
RHIC Retreat, Shelter Island  
15 June 2005

- Injection kicker rise time / bunch length
- Pressure rise
  - Warm vacuum
  - Cold vacuum
- Beam-beam interaction on ramp
  - RF frequency locking
  - Orbit separation

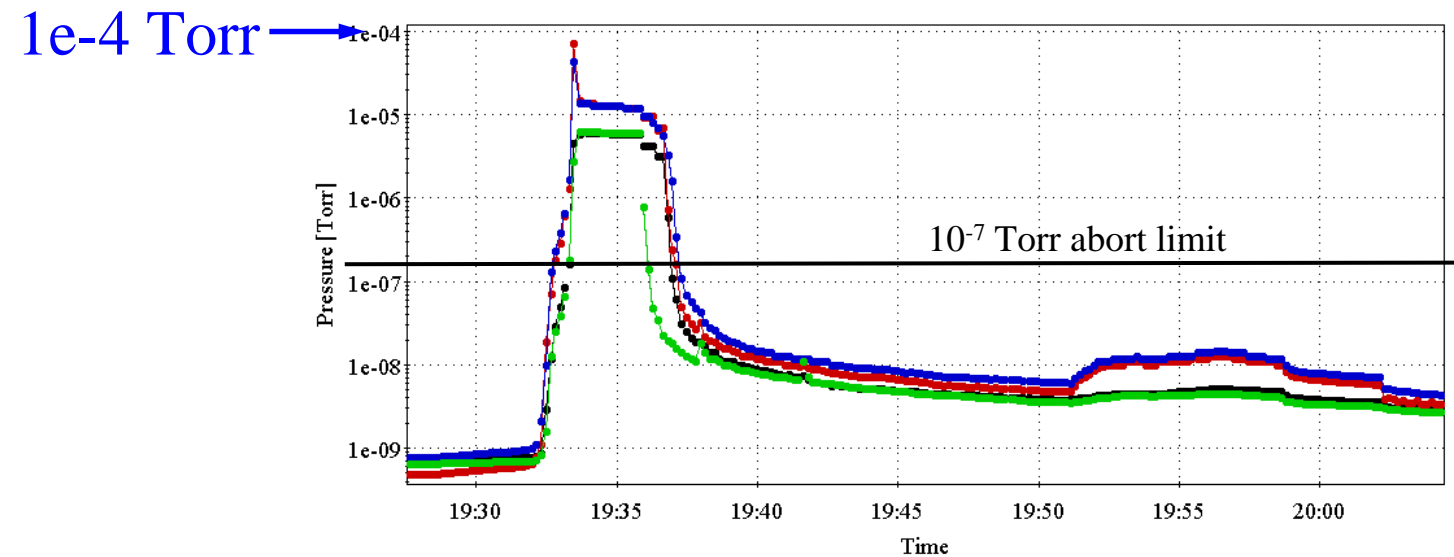
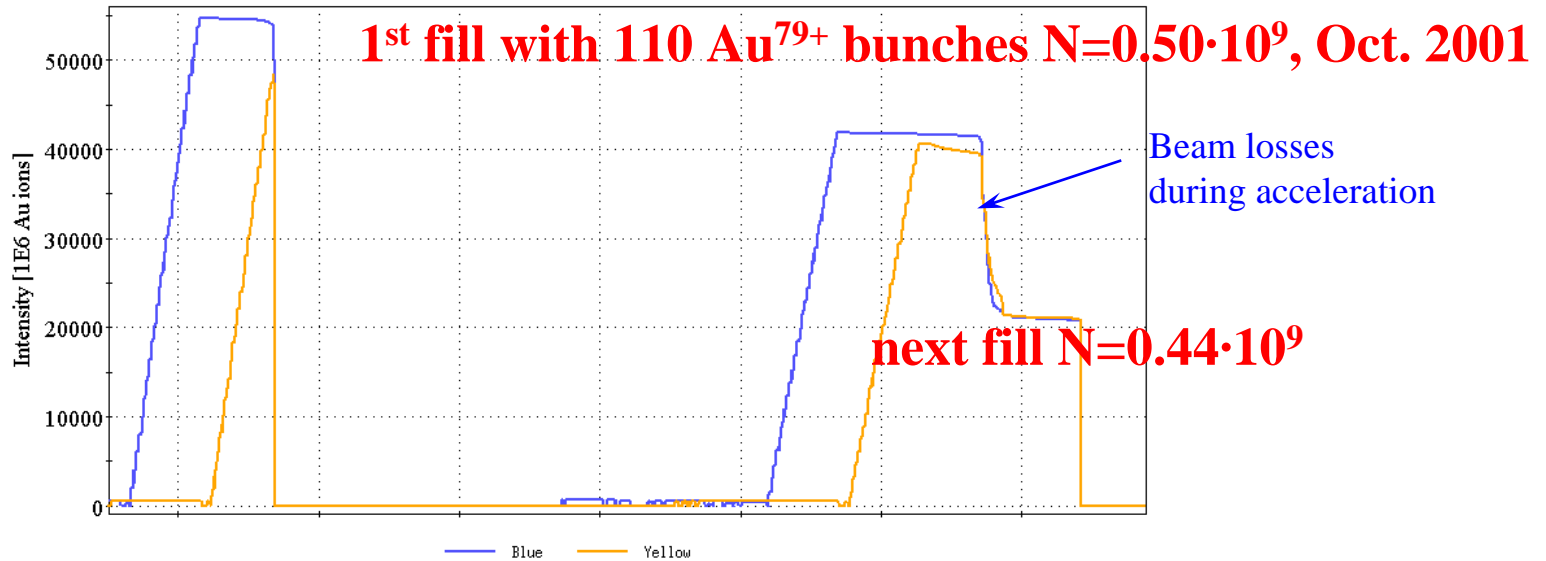
# Injection kicker

- Had reduced injection kicker jitter (H. Hahn) and drift (part of auto-setup)
- Injection kicker rise time (95ns) just enough for 111 bunches (encountered problems with long p-bunches)

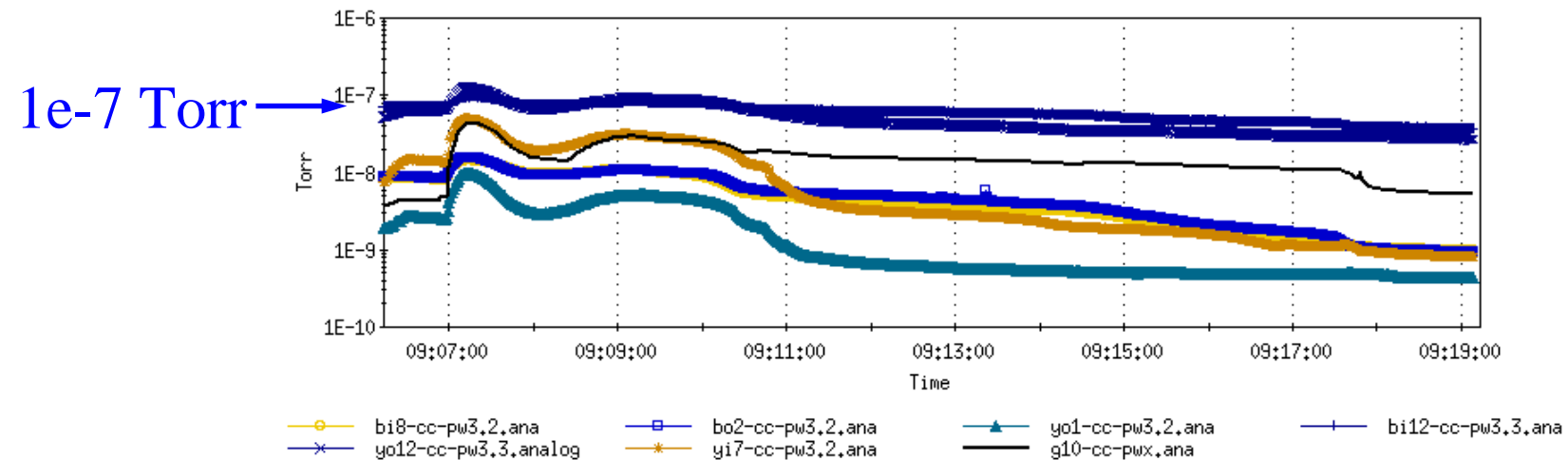
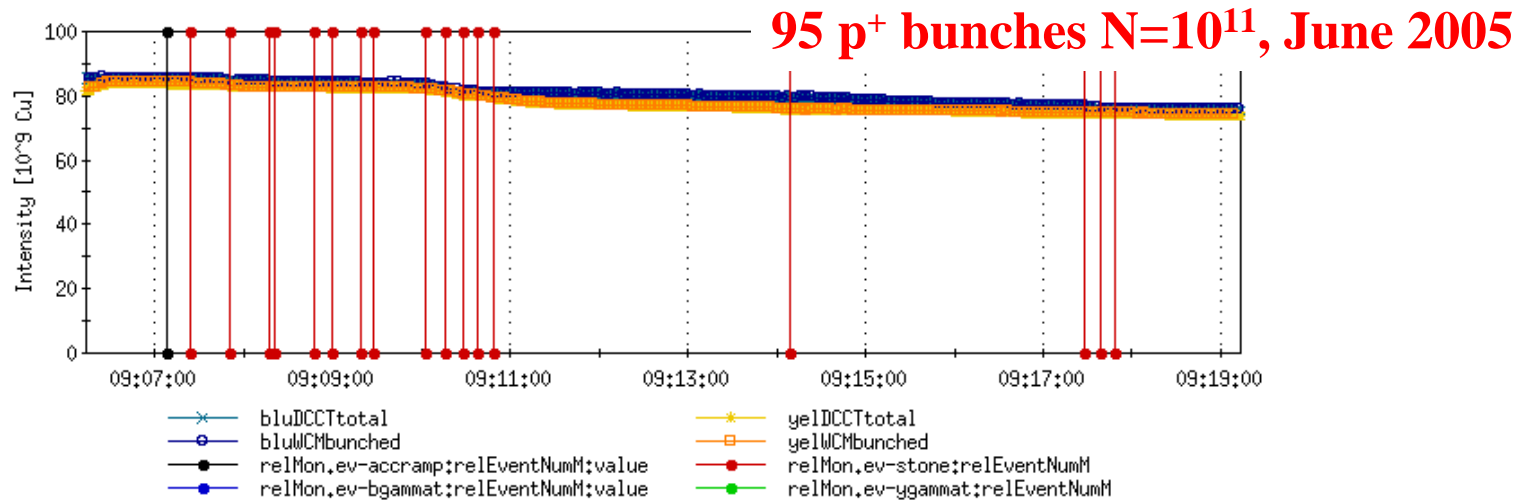
Thu Oct 4 13:43:14 2001, cycle 1002217388 Blue Injection Kicker



# Pressure rise from e-cloud - then



# Pressure rise from e-cloud – and now



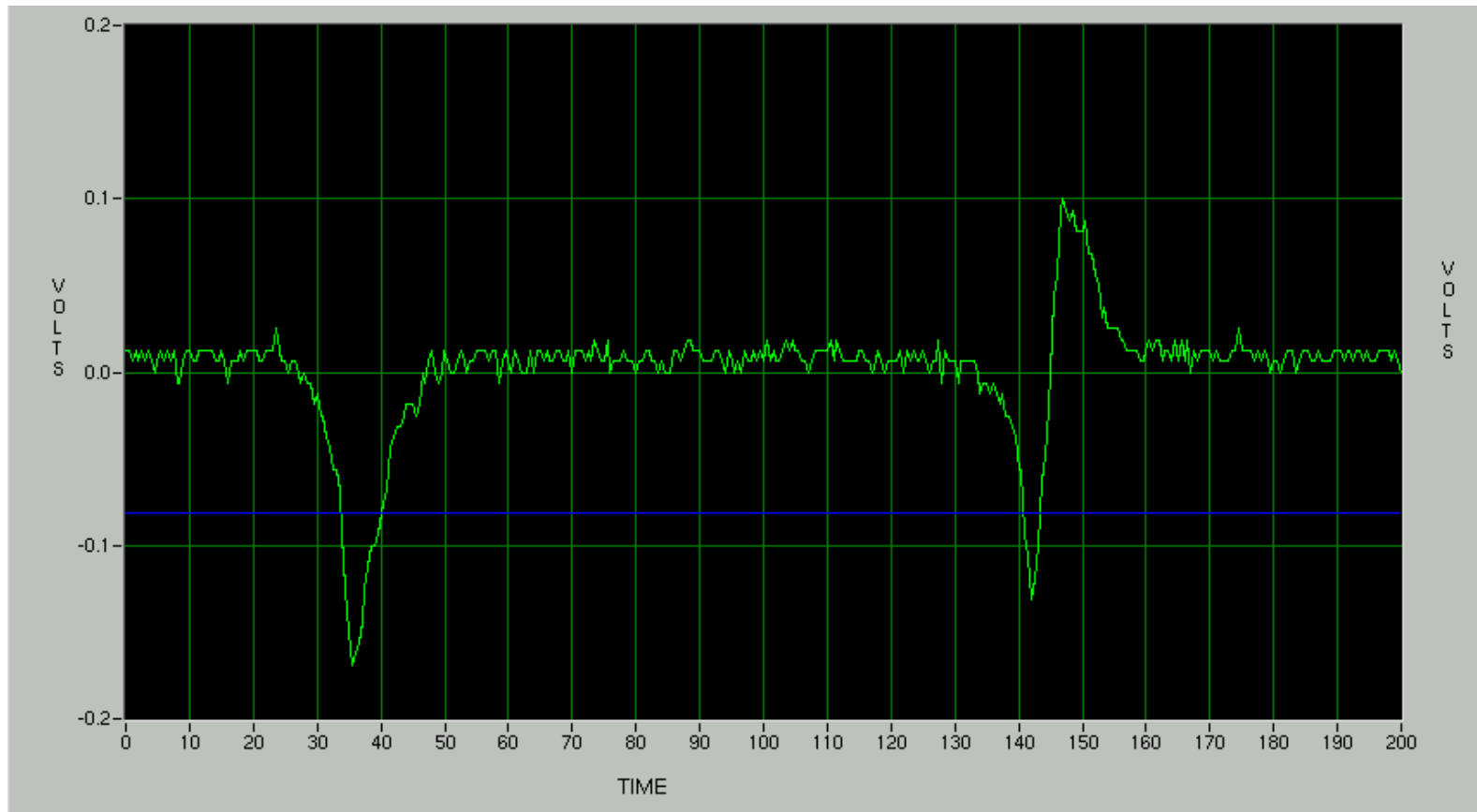
[Also accelerated 111 Blue bunches, single Yellow bunch.]

## Pressure rise

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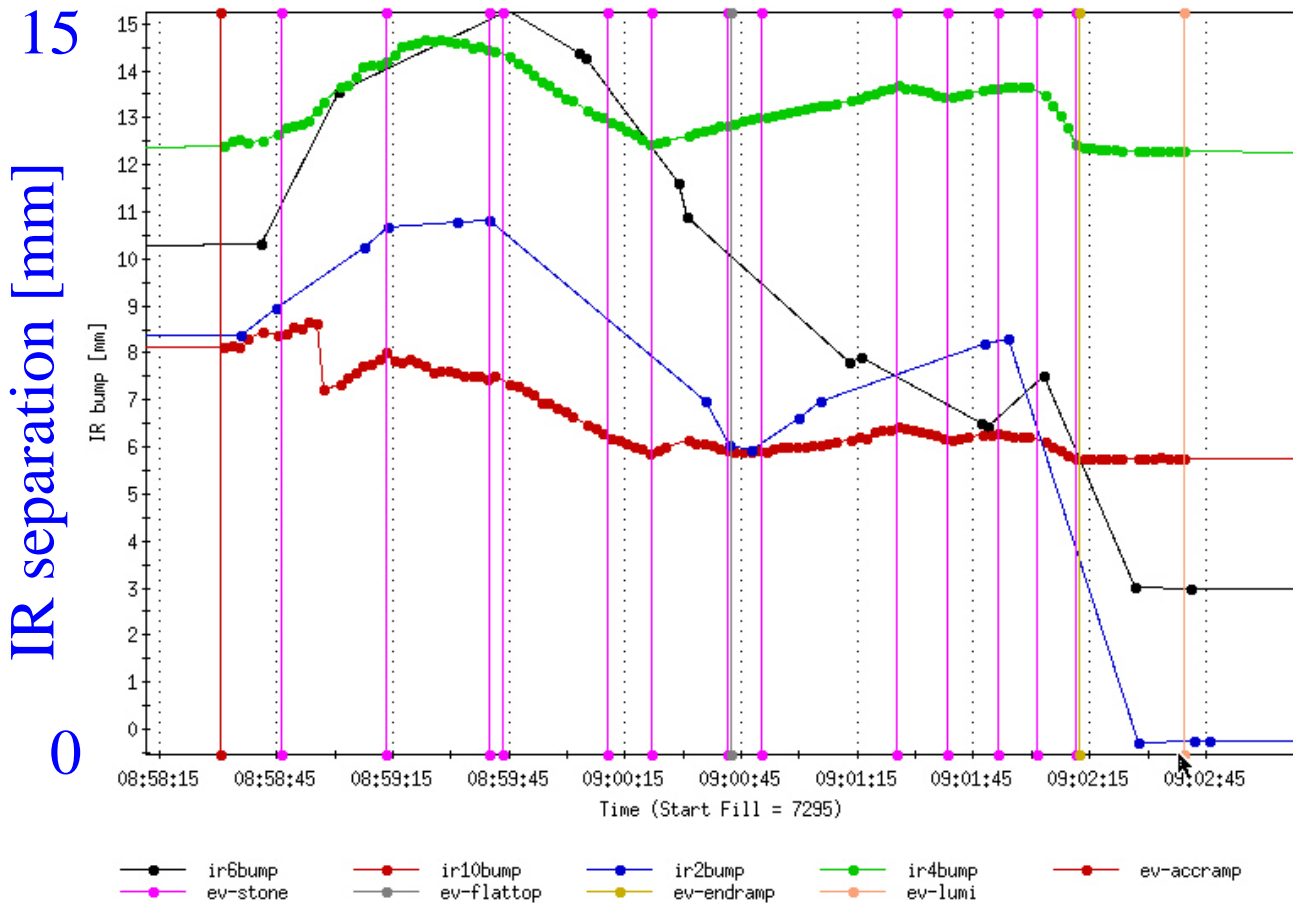
- Can operate with 111 p-bunches and  $10^{11}$ p/bunch
- Gas load from e-cloud approximately proportional to bunch intensity
  - operation with  $2 \times 10^{11}$ p/bunch should be ok after upgrade of cold bore vacuum
- During transition crossing and with storage rf system have shorter bunches with ions
  - expect higher pressure with ion beams of same charge per bunch
  - same pressure can produce more experimental background with ions

# Beam-beam interaction



- No longitudinal separation possible with  $>56$  bunches
- RF frequency lock on ramp avoids modulated long-rang beam-beam
- Good lock with protons, some slippage for ions near transition

# Transverse separation on ramp



- Have maintained sufficient separation with protons (V. Ptitsyn)
- Requires constant attention

## Summary – 111 bunches

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- Injection kickers
  - Need to be careful with long p-bunches
- Vacuum
  - Acceptable with  $10^{11}$  p/bunch and 111 bunches
  - Need to be careful with experiments, polarimeters, ...
- RF frequency lock on ramp
  - Ok for protons
  - Improvement during transition crossing for ions desirable
- Transverse separation
  - Ok in pp operation

**After shutdown work 111 operation should be possible  
with 100GeV protons and  $2 \times 10^{11}$  p/bunch.**

**Need to continue upgrades for ions and 250GeV p.**